

U.S. Patent Application Serial No. 09/963,575
Amendment dated October 14, 2003
Reply to OA of July 14, 2003

REMARKS

Claims 1-8 are pending in this application. By this Response, claims 1, 2, and 5 are being amended to further clarify the present invention.

Applicant respectfully believes that no new matter has been added, and that this Response is fully responsive to the final Office Action mailed **July 14, 2003** (Paper No. 6).

The present invention is characterized by emphasizing a contrast between two elements (a sheathing portion of an electric wire and a mirror-like surface of a crimping piece) (p. 11, line 3). The two elements have different directional reflectivities by optimizing an arrangement of a light source and an image-taking means.

Claims 1, 5, and 6 are Not Obvious

Claims 1, 5, and 6 are rejected under 35 U.S.C. § 103 as being unpatentable over US Pat. 5,377,278 issued to Ichikawa (**Ichikawa '278**) in view of US Pat. 6,047,084 issued to Kent et al. (**Kent '084**). Claims 1 and 5 are amended to further clarify the claimed invention. Applicant respectfully submits that claims 1, 5, and 6 are not obvious, and respectfully requests that the Examiner withdraw this rejection of claims 1, 5, and 6, for the following reasons.

Firstly, Applicant respectfully submits that claim 1, as amended, is allowable over the

Ichikawa '278 and Kent '084, because those references fail to teach or suggest “An inspection method of a terminal metal fitting having a ... a sheathed electric wire with a normal diffuse reflection surface and a crimping piece with a mirror reflection surface ... , comprising the steps of: illuminating the wire connecting portion fastened to the electric wire from a first specific direction; taking an image of the wire connecting portion from a second specific direction; ... calculating whether an area is less than or not less than a threshold value in image information obtained by the binary processing; and judging good or bad of a fastening condition of the electric wire by the crimping piece on a basis of the area.”

In particular, regarding claim 1, **Ichikawa '278 and Kent '084** fail to teach or suggest the sheathed electric wire with a normal diffuse reflection surface, the crimping piece with a mirror reflection surface, the illuminating from a first specific direction, the taking of an image from a second specific direction, the calculating of the area less than or not less than a threshold value, and the judging of good or bad of a fastening condition on a basis of the area.

Secondly, Applicant respectfully submits that claim 5, as amended, is allowable over the **Ichikawa '278 and Kent '084**, because those references fail to teach or suggest “An inspection system ... , comprising: a judging means to binary-process an image of the wire connecting portion illuminated by the light source and judge good or bad of a fastening condition of the electric wire by the crimping piece on a basis of an area being less than or not less than a threshold value in image

information obtained by the binary processing, wherein the image-taking means and the light source are arranged so that the light thrown from the light source and reflected by the crimping piece with a mirror reflection surface enters the image-taking means and a sheathing portion of the electric wire has a normal diffuse reflection surface.”

Also, Applicant notes that, in claim 5, the light source and the image-taking means are so arranged to transmit light from the crimping piece into the image-taking means, so that a coded bi-level image of the crimping piece is white and a coded bi-level image of the electric wire sheathing is black.

Ichikawa ‘278 uses a captured image to determine whether a solderless terminal has been crimped against an electrical conductor, and relies on luminance change points A through H to inspect the terminal (FIG. 4). **Ichikawa ‘278** does not indicate that it utilizes the above-described features of claims 1 and 5, as amended.

On the contrary, **Ichikawa ‘278** utilizes a histogram to determine whether a crimp is satisfactory. The use of the histogram, and the other features of this reference, fail to teach or suggest the combination of features of claims 1 and 5 discussed above such as the claimed “area”, crimping piece with mirror reflection surface, and sheathing portion with normal diffuse reflection surface.

Kent ‘084 uses a captured image to determine the accuracy of a placement of parts relating to a pad 202, part 900, lead 902, and paste 200 (col. 13, lines 30-32, FIG. 9), and uses polygon shapes of the pad 202 and of other elements. The key features of **Kent ‘084**, in the determination of the accuracy of a circuit assembly, include the polygon shapes of the pad 202 and of other elements (col. 13, lines 32-37, FIG. 9). **Kent ‘084** does not indicate that it utilizes the above-described features of claims 1 and 5, as amended.

On the contrary, **Kent ‘084** utilizes polygon shapes to determine whether a status is satisfactory. The use of the polygons, and the other features of this reference, fail to teach or suggest the combination of features of claims 1 and 5 discussed above such as the claimed “area”, crimping piece with mirror reflection surface, and sheathing portion with normal diffuse reflection surface.

Claim 6 depends from claim 5. Therefore, in view of the foregoing, Applicant respectfully requests that the Examiner withdraw the rejection of claims 1, 5, and 6.

Claims 2-4 are Not Obvious

Claims 2-4 are rejected under 35 U.S.C. § 103 as being unpatentable over **Ichikawa ‘278** in view of **Kent ‘084** and US Pat. 5,899,959 issued to Shields et al. (**Shields ‘959**). Claim 2 is

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amended to further clarify the claimed invention. Applicant respectfully requests that the Examiner withdraw this rejection of claims 2-4 for the following reasons.

Applicant respectfully submits that claim 2, as amended, is allowable over the **Ichikawa '278**, **Kent '084**, and **Shields '959** because those references fail to teach or suggest an inspection system ... comprising: a judging means to judge whether good or bad as to a fastening condition on a basis of an area being less than or not less than a threshold value, wherein the light thrown from the light source and reflected by the crimping piece with a mirror reflection surface does not enter the image-taking means, and a sheathing portion of the electric wire is a light color with a normal diffuse reflection surface.

Also, Applicant notes that, in claim 2, the light source and the image-taking means are so arranged in order to not transmit light from the crimping piece directly into the image-taking means, so that a coded bi-level image of the crimping piece is black and a coded bi-level image of the electric wire sheathing is white.

Ichikawa '278 and **Kent '084** are discussed in detail above, and are shown above to be deficient regarding claimed “area”, crimping piece with mirror reflection surface, and sheathing portion with normal diffuse reflection surface.

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Shields ‘959 is merely relied on by the Examiner with respect to camera 24 located inside box 64 (col. 7, lines 5-11, FIG. 2, abstract). **Shields ‘959** fails to remedy the above-described deficiencies of **Ichikawa ‘278** and **Kent ‘084.**, because **Shields ‘959** does not teach or suggest the above-listed features as set forth in Applicant’s claim 2, as amended.

Claims 3 and 4 depend from claim 2. Therefore, in view of the foregoing, Applicant respectfully requests that the Examiner withdraw the rejection of claims 2-4.

Claims 7 and 8 are Not Obvious

Claims 7 and 8 are rejected under 35 U.S.C. § 103 as being unpatentable over **Ichikawa ‘278** in view of **Kent ‘084**, **Shields ‘959**, and US Pat. 5,774,574 issued to Hoki (**Hoki ‘574**). Applicant respectfully requests that the Examiner withdraw this rejection of claims 7 and 8 for the following reasons.

Claims 7 and 8 depend from claims 2 and 5. Regarding claim 2, Applicant has demonstrated above that **Ichikawa ‘278**, **Kent ‘084**, and **Shields ‘959** fail to teach or suggest base claim 2, as amended. Regarding claim 5, Applicant has demonstrated above that **Ichikawa ‘278** and **Kent ‘084** fail to teach or suggest base claim 5, as amended.

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Hoki ‘574 compares a binary image with a standard image to detect defects in a printed substrate (col. 5, lines 28-32, abstract).

Regarding claim 2, as amended, Applicant respectfully believes that **Hoki ‘574** fails to remedy the above-described deficiencies of **Ichikawa ‘278**, **Kent ‘084**, and **Shields ‘959**, because **Hoki ‘574** does not teach or suggest Applicant’s claimed combination of: a sheathing portion of an electric wire with a normal diffuse reflection surface; a crimping piece with a mirror reflection surface; an area less than or not less than a threshold value; and the judging of a fastening condition on a basis of the area, as set forth in claim 2, as amended.

Regarding claim 5, as amended, Applicant respectfully believes that **Shields ‘959** and **Hoki ‘574** fail to remedy the above-described deficiencies of **Ichikawa ‘278** and **Kent ‘084**, because **Shields ‘959** and **Hoki ‘574** do not teach or suggest Applicant’s claimed combination of: a sheathing portion of an electric wire having a normal diffuse reflection surface; a crimping piece with a mirror reflection surface; an area less than or not less than a threshold value; and the judging of a fastening condition on a basis of the area, as set forth in claim 5, as amended.

Therefore, in view of the foregoing, Applicant respectfully requests that the Examiner withdraw the rejection of claims 7 and 8.

Claims 1-8 are Not Obvious

In view of the foregoing amendments and remarks, it is respectfully believed that essential elements of a *prima facie* case of obviousness are missing. Firstly there is no suggestion or motivation either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to combine the reference teachings to arrive at Applicant's claimed invention, as set forth in claims 1-8, as amended. Secondly, the references do not teach or suggest all the claim limitations of claims 1-8, as amended.

Accordingly, Applicant respectfully submits that the Examiner will not be able to establish a *prima facie* case regarding claims 1-8, as amended, in view of the cited art. Therefore, Applicant respectfully believes that the rejection of claims 1-8 should be withdrawn.

Entry of the foregoing amendments is proper under 37 CFR § 1.116 because those amendments comply with requirements of form expressly set forth in the previous Office action or present rejected claims in better form.

Accordingly, in view of the foregoing, claims 1-8, as amended, are respectfully believed to be in condition for allowance, which action, at an early date, is respectfully requested.

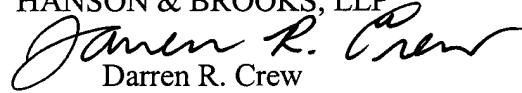
If the Examiner feels that this application is not currently in condition for allowance, the

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Examiner is requested to contact Applicant's undersigned attorney at the telephone number indicated below to arrange for a telephone conference to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

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PATENT TRADEMARK OFFICE

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application, and entry of this listing of claims is respectfully requested:

Listing of Claims:

1 Claim 1 (currently amended): An inspection method of a terminal metal fitting having
2 a wire connecting portion having a wall carrying ~~an a~~ a sheathed electric wire with a normal diffuse
3 reflection surface and a crimping piece with a mirror reflection surface bent toward the wall so as
4 to fasten the electric wire between the crimping piece and the wall, comprising the steps of:
5 illuminating the wire connecting portion fastened to the electric wire from a first specific
6 direction;
7 taking an image of the wire connecting portion from a second specific direction;
8 binary-processing the image of the wire connecting portion being illuminated;
9 calculating whether an area is less than or not less than a threshold value in image
10 information obtained by the binary processing; and
11 judging good or bad of a fastening condition of the electric wire by the crimping piece on a
12 basis of the area.

1 Claim 2 (currently amended): An inspection system of a terminal metal fitting having

2 a wire connecting portion having a wall carrying an electric wire and a crimping piece bent toward
3 the wall so as to fasten the electric wire between the crimping piece and the wall, comprising:

4 a light source to illuminate the wire connecting portion;

5 an image-taking means to take an image of the wire connecting portion;

6 a dark box, with a dark inner surface, to cover at least an object side of the image-taking
7 means, the light source, and the terminal metal fitting for preventing outer light from shining on the
8 wire connecting portion; and

9 a judging means to binary-process an image of the wire connecting portion being illuminated
10 by the light source and judge whether good or bad as to a fastening condition of the electric wire by
11 the crimping piece on a basis of an area being less than or not less than a threshold value in image
12 information obtained by the binary processing,

13 wherein the image-taking means and the light source are arranged so that the light thrown
14 from the light source and reflected by the crimping piece with a mirror reflection surface does not
15 enter the image-taking means, and a sheathing portion of the electric wire is a light color with a
16 normal diffuse reflection surface.

1 Claim 3 (original): The inspection system of the terminal metal fitting as set forth in claim
2, wherein

3 the image-taking means faces the wall of the wire connecting portion to which the electric
4 wire is fastened,

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5 and the light source is arranged at a position of making an angle θ between a line connecting
6 the light source with the crimping piece and a direction of the electric wire fastened to the wire
7 connecting portion so that the light thrown from the light source and reflected by the crimping piece
8 does not enter the image-taking means.

1 Claim 4 (original): The inspection system of the terminal metal fitting as set forth in claim
2 3, wherein
3 the light source is arranged at a position of making the angle θ of not more than 45 degrees.

1 Claim 5 (currently amended): An inspection system of a terminal metal fitting having
2 a wire connecting portion having a wall carrying an electric wire and a crimping piece bent toward
3 the wall so as to fasten the electric wire between the crimping piece and the wall, comprising:
4 a light source to illuminate the wire connecting portion;
5 an image-taking means to take an image of the wire connecting portion;
6 a judging means to binary-process an image of the wire connecting portion illuminated by
7 the light source and judge good or bad of a fastening condition of the electric wire by the crimping
8 piece on a basis of an area being less than or not less than a threshold value in image information
9 obtained by the binary processing,
10 wherein the image-taking means and the light source are arranged so that the light thrown
11 from the light source and reflected by the crimping piece with a mirror reflection surface enters the

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12 image-taking means and a sheathing portion of the electric wire has a normal diffuse reflection
13 surface.

1 Claim 6 (original): The inspection system of the terminal metal fitting as set forth in claim
2 5, wherein

3 the image-taking means faces the wall of the wire connecting portion to which the electric
4 wire is fastened,

5 and the light source faces the wall of the wire connecting portion, to which the electric wire
6 is fastened, near the image-taking means so that the light thrown from the light source and reflected
7 by the crimping piece enters the image-taking means.

1 Claim 7 (previously presented): The inspection system of the terminal metal fitting as
2 set forth in any one of claims 2-6, wherein the judging means judges whether good or bad as to a
3 fastening condition of the electric wire on a basis of an area being less than or not less than a
4 threshold value in an inspection area in the image of the wire connecting portion taken by the image-
5 taking means, the inspection area being provided for each crimping piece and including at least
6 partial image of the crimping piece.

1 Claim 8 (original): The inspection system of the terminal metal fitting as set forth in claim
2 7, wherein

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3 the inspection area is positioned over a longitudinal axis of the electric wire fastened to the
4 wire connecting portion.